Greenhouse Management

Greenhouse Management sets a foundation for progress in the horticulture sub-cluster area. As populations continue to expand, the importance of food production in a condensed, climate-controlled environment increases. Understanding the integrated principles needed for the successful management of a greenhouse will allow the agricultural industry to continue to produce the quality and quantity of food and fiber needed in the 21st century.

Pre-requisites: **None**

Recommended Credit: **1 or 2**

Recommended Grade Levels: **9th, 10th, or 11th**

***** **1 denotes learning expectations that must be met when teaching the course for the 1st credit.**

****** **All other learning expectations must be met when teaching the course for the 2nd credit.**

Greenhouse Management

Standard 1.0

The student will research and discuss job opportunities in the horticulture field.

Standard 2.0

The student will demonstrate correct procedures for handling pesticides and utilize general safety practices in the greenhouse.

Standard 3.0

The student will evaluate the properties of different types of soil media.

Standard 4.0

The student will evaluate the different structures and functions of plants.

Standard 5.0

The student will describe proper methods of asexual and sexual plant propagation.

Standard 6.0

The student will describe proper nutrition and watering techniques with greenhouse crops.

Standard 7.0

The student will select greenhouse crops and identify common plants in greenhouse production.

Standard 8.0

The student will develop organizational skills and work ethics necessary in greenhouse production.

Standard 9.0

The student will demonstrate the control of common greenhouse diseases and pests using integrated pest management systems.

Standard 10.0

The student will integrate academic competencies with greenhouse management concepts.

Standard 11.0

The student will develop premier leadership and personal growth needed in a greenhouse management career.

Greenhouse Management

Course Description:
This course is designed to develop basic skills and general knowledge of greenhouse operations. It includes standards regarding environmental needs of plants, government regulations of greenhouses and management skills needed for successful greenhouse production.

Standard 1.0

The student will research and discuss job opportunities in the horticulture field.

Learning Expectations:
The student will:

1.1	Explore job opportunities available in the area of greenhouse management.	**1**
1.2.	Evaluate local job opportunities in greenhouse management.	**1**
1.3.	Determine skills necessary for success in the greenhouse industry.	**1**
1.4.	Evaluate the importance of greenhouse crop production to feeding a growing population.	

Evidence standard is met:
The student will:

- Participate in group presentations on job opportunities in the community.
- Present career paths available in the greenhouse and horticulture industry.
- Describe skills needed by a greenhouse operator to maintain a viable business.
- Determine the amount of food and fiber produced annually by greenhouse industries.

Integration/Linkages
Language Arts, Social Studies, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks

- Use the Internet to research career opportunities in greenhouse production.
- Chart the career path a student will take for five job opportunities in horticulture.
- Discuss how the greenhouse management jobs are integrated in the community.
- Perform a mock job interview for a greenhouse position.
- Create a portfolio of career opportunities in horticulture.
- Determine the percentage of fresh produce in the grocery store that is grown in greenhouses.

Standard 2.0

The student will demonstrate correct procedures for handling pesticides and utilize general safety practices in the greenhouse.

Learning Expectations:
The student will:

2.1	Follow industry safety standards in the greenhouse and work area.	**1**
2.2	Evaluate proper chemical/pesticide safety standards.	**1**
2.3	Assess the purpose of worker protection standards.	**1**
2.4	Compare the uses and types of chemicals used in greenhouse production.	

Evidence Standard is met:
The student will:

- Complete a safety exam on industry safety standards of no less than 90% accuracy.
- Demonstrate proper use of safety equipment in the greenhouse.
- Demonstrate the use of chemicals used in greenhouse production.
- Determine what worker protection standards are necessary for a safe working environment.

Integration/Linkages
Biology, Mathematics, Chemistry, Language Arts, OSHA Standards, TOSHA Standards, EPA Regulations, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks

- Determine licensing regulations and procedures for developing and maintaining a chemical inventory.
- Use information on chemical labels to fight insects and diseases.
- Demonstrate the safe mix and application of various greenhouse chemicals.
- Design and maintain a chemical application log.
- Compute chemical costs for plant applications.
- Demonstrate cleaning and maintaining chemical equipment.
- Design a storage area for chemicals.
- Prepare proper disposal procedures for chemicals and chemical containers.
- Create a chart that identifies worker protection standards.

Standard 3.0

The student will evaluate the properties of different types of soil media.

Learning Expectations:

The student will:

3.1	Describe the major functions of growing media.	**1**
3.2	Analyze attributes of growing media.	**1**
3.3	Determine cost effectiveness of premix or personal mix.	

Evidence Standard is met:

The student will:

- Describe the functions of growing media.
- Demonstrate the attributes of growing media on growing plants.
- Perform a cost analysis of premix versus personal mix.
- Determine and contrast the pH of different growing media.

Integration/Linkages

Mathematics, Physical Science, Language Arts, Geography, Chemistry, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks

- List the major functions of a growing media.
- Match the major components of growing media to their descriptions.
- Compare the advantages and disadvantages of different growing media.
- Complete statements concerning proper sterilization of media.
- Demonstrate methods of adjusting pH.
- Calculate the volume of media required for a specified quantity of plants.
- Calculate the amount of additives required for a growing media for a specified number of plants.

Standard 4.0

The student will evaluate the different plant structures and functions of those structures.

Learning Expectations:

The student will:

4.1	Evaluate the importance of plant structures.	
4.2	Specify the functions of plant structures.	**1**

Evidence Standard is met:

The student will:

- Determine how plant structures affect growth and fruit production.
- Recognize plant structures from different greenhouse plants.

Integration/Linkages

Botany, Art, Language Arts, Biology, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks

- Dissect a monocotyledon, identifying and labeling plant structures.
- Dissect a dicotyledon, identifying and labeling plant structures.
- Draw a picture of a greenhouse plant, labeling the plant structures and describing their functions.

Standard 5.0

The student will describe proper methods of asexual and sexual plant propagation.

Learning Expectations:

The student will:

5.1 Explain methods of plant propagation. **1**
5.2 Compare the benefits of asexual versus sexual reproduction.
5.3 Evaluate the techniques of sexual and asexual reproduction of plants.

Evidence Standard is met:

The student will:

- Reproduce plants using asexual and sexual reproductive methods.
- Chart the benefits of sexual and asexual propagation.
- Demonstrate the different methods of propagation.
- Compare rooting hormones through plant propagation experiments.

Integration/Linkages

Language Arts, Chemistry, Biology, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks

- Relate terms associated with propagation to their correct definitions.
- Determine the selection of propagation chambers and heat mats.
- Choose appropriate seed varieties and calculate crop schedules for the local markets.
- Select growing media and seed sowing arrangement for a selected crop.
- Chart the stages of seed germination, using lab plants for the data.
- Describe the proper method for transplanting seedlings.
- Prepare seed for storage.
- Produce and maintain stock plants for asexual propagation.
- Prepare harvest cuttings.
- Apply root-promoting chemicals.
- Demonstrate stick cuttings and transplanting cuttings.
- Label plants during propagation by common and scientific names.

Standard 6.0

The student will describe proper nutrition and watering techniques with greenhouse crops.

Learning Expectations:

The student is able to:

6.1 Evaluate the benefits of proper watering of plants. **1**
6.2 Evaluate the benefits of proper nutrition of plants. **1**
6.3 Examine how water pH interacts with plant growth.

Evidence Standard is met:

The student will:

- Demonstrate proper watering techniques.
- Compare the benefits of proper nutrients on plant growth to nutrient deficiencies.
- Demonstrate how water pH can affect plant growth.

Integration/Linkages

Mathematics, Biology, Chemistry, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks

- Analyze the effect essential elements have on plant growth.
- Test how different media pH affects nutrient availability.
- Examine fertilizer reaction on media pH.
- Determine the effect of fertilizers on total soluble salt concentrations.
- Prepare a chart, showing the various fertilizing methods.
- Calculate fertilizer rates needed for different greenhouse plants.
- Perform media tests for nutrient levels.
- Compare and contrast the effects of nutritional deficiency and toxicity problems.
- Develop procedures for correcting nutritional deficiencies.
- Demonstrate how water pH can affect plant growth.

Standard 7.0

The student will select greenhouse crops and identify common plants in greenhouse production.

Learning Expectations:

The student will:

7.1	Evaluate the use of different greenhouse crop species for production.	**1**
7.2	Compare the advantages and disadvantages of common plants grown in greenhouses.	**1**
7.3	Distinguish between annual and perennial plants.	**1**

Evidence Standard is met:

The student will:

- Recommend greenhouse crops to meet the demands of local markets.
- Prepare a schedule for when crops are produced.
- Identify, by common and scientific names, plants grown in greenhouses.
- Utilize trade magazines and computers to research profitable crops.

Integration/Linkages

Technology Education, Language Arts, Biology, Botany, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks

- Identify 40 common plants grown in the greenhouse.
- Compare the differences between annual and perennial plants.
- Discuss how to select production containers.
- Calculate space requirements for crop production.
- Prepare a planning production schedule for a specified crop.
- Discuss proper acclimatization procedures.
- Calculate fertilizer and water requirements to complete a production schedule for a crop.
- Demonstrate the ability to produce foliage hanging baskets and produce a crop of pot mums.

Standard 8.0

The student will develop organizational skills and work ethics necessary in greenhouse production.

Learning Expectations:

The student will:

8.1 Develop skills to manage the completion of production schedules.
8.2 Evaluate work habits needed to create a positive atmosphere.
8.3 Evaluate the importance of record keeping.

Evidence Standard is met:

The student will:

- Create a production schedule, delegating responsibilities to co-workers.
- Determine work ethics and habits necessary for a successful operation.
- Develop a daily work schedule for co-workers.
- Complete a record book on plant production.

Integration/Linkages
Language Arts, Social Studies, Business Education, Accounting Computer Science, National FFA Code of Ethics, Leadership, SCANS (Secretary's Commission on Achieving Necessary Skills)

Performance Tasks
- Prepare and sign an employee/employer work agreement for the greenhouse.
- Produce a work schedule for the greenhouse.
- Complete a record book on plant production.
- Complete income and expense sheets for a specified crop.
- Develop a plant production schedule to meet the demands of the local community.

Standard 9.0
The student will demonstrate the control of common greenhouse diseases and pests using integrated pest management systems.

Learner Expectations:
The student will:
9.1 Evaluate the effects of common diseases in greenhouse production.
9.2 Evaluate the effects of common pests in greenhouse production.
9.3 Assess common methods of control of greenhouse pests and diseases.
9.4 Evaluate the use of integrated pest management (IPM) for controlling greenhouse pests and diseases.

Evidence that Standards are met:
The student will:
- Determine the effects of various diseases in a greenhouse environment.
- Determine the effects of different pests in a greenhouse environment.
- Recommend methods of controlling greenhouse pests and diseases.
- Compare the advantages and disadvantages of using IPM's in controlling pests and diseases.

Integration/Linkages
Biology, Language Arts, Chemistry, Ecology, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks
- Identify diseases and pests from live and laboratory samples.
- Debate factual and fictional information about pest problems.
- Distinguish between the types of management techniques for pest problems.
- Prepare a schedule for clinical applications of chemicals.
- Compare chemical injury to plants to injury from diseases and pests.
- Specify the most common greenhouse pests and beneficial insects used to control them.
- Discuss the benefits of implementing IPM in the greenhouse.

Standard 10.0
The student will integrate academic competencies with greenhouse management concepts.

Language Arts:
The student will:
10.1 Use current technology to research data on greenhouse operations.
10.2 Prepare a presentation on using a greenhouse for food production. **1**
10.3 Demonstrate proper grammar usage in completing technical forms and reports for the greenhouse. **1**

Mathematics:
The student will:
10.4 Use basic algebraic equations to determine materials needed in the greenhouse.
10.5 Use basic mathematics computations to calculate nutrient and fertilizer requirements.
10.6 Demonstrate English/Metric conversions.
10.7 Use geometric measurements to determine space requirements and structural designs.

Science:

The student will:

10.8	Demonstrate how basic biological principles of plants affect growth.	**1**
10.9	Assess chemical properties of elements and media mixtures on plant growth.	**1**
10.10	Apply basic laws of physics to greenhouse structures.	
10.11	Apply principles of Earth science to plant growth and nutrient sources.	

Evidence standard is met:

The student will:

- Present oral and written presentations on greenhouse production concepts.
- Use computer technology in gathering and dispersing information on greenhouse production.
- Use basic mathematical and algebraic formulas to compute the nutritional and environmental needs of plants.
- Recommend plant varieties on the basis of geography and other demographics.
- Specify regulations that affect the greenhouse industry.

Integration/Linkages

Chemistry, Physics, Mathematics, Language Arts, Social Studies, Computer Technology, Government, Business and National Horticulture Standards, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks

- Develop presentation on an aspect of greenhouse production.
- Research the Internet for information on greenhouse production.
- Compute fertilization needs of plants in a greenhouse.
- Develop a plan for meeting the sunlight and darkness needs of various plants.
- Develop a brochure to meet the plant demands of the local community.
- Create a plan of compliance for federal and state regulations.

Standard 11.0

The student will develop premier leadership and personal growth needed in a greenhouse management career.

Learner Expectations:

The student will:

11.1	Discuss how the FFA has changed as agriculture has changed.	**1**
11.2	Develop public speaking skills needed in the greenhouse industry.	
11.3	Conduct meetings use approved parliamentary law.	**1**
11.4	Develop an SAEP, supervised agricultural experience program, for a greenhouse enterprise.	**1**

Evidence Standard is met:

The student will:

- Outline the significant events in the history of the FFA.
- Demonstrate correct public speaking procedures.
- Demonstrate correct parliamentary procedure skills, using Robert's Rules of Order.
- Develop a business plan for a simulated SAEP in for a greenhouse industry.

Integration/Linkages

Language Arts, Social Studies, National FFA Guidelines for Parliamentary Procedure CDE, National FFA Guidelines for Prepared Speaking CDE, National FFA Guidelines for Proficiency Awards and Degrees, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks

- Demonstrate five different parliamentary procedure skills.
- Prepare two-to-three minute speech on greenhouse production.
- Complete an application for a proficiency award and advanced FFA degree.
- Create a time-line, listing the significant events in the history of the FFA and relate them to America's history.